Notice of Allowability	Application No.	Applicant(s)	
	09/686,780	KLOSOWSKI ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *26 April 2005*.

2. ☒ The allowed claim(s) is/are *1-3 and 5-7*.

3. ☒ The drawings filed on *06 August 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Introduction

1. This communication is in response to the Applicant's communication dated April 26, 2005. Claim 7 was added. Claims 1-3 and 5-7 of the application are pending.

Drawings

2. The drawings submitted on August 6, 2004 are accepted.

Examiner's Amendment

3. Authorization for this examiner's amendment was given in two telephone conversations by Mr. Eric Petraske on July 5, 2005.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to the applicants, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

4. In the Claims:

In Claim 1:

Replace claim 1 with:

A computer implemented method for annotating the surface of a computer model having a set of computer model vertices and computer model polygons, wherein the annotations comprise line segments and are specified as geometry in the form of a set of annotation vertices and annotation edges that connect the vertices, comprising the steps of:

a) Selecting an annotation edge that connects a pair of the annotation vertices;

b) projecting the pair of annotation vertices of the edge onto the surface of the computer model to obtain projected vertices;

c) selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices;

d) cutting the surface of the model with the cutting plane, the plane intersecting the model on a cutting line;

e) reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model; and

e) repeating steps b) to e) for each annotation edge in the annotation specified.

In Claim 2:

Replace claim 2 with:

A method as in claim 1, where if the projected vertices and the midpoint of the annotation edge are collinear, the cutting plane is defined by containing the two projected vertices and a normal to the surface of the model at one or more of the projected vertices.

In Claim 5:

Replace claim 5 with:

A computer system that annotates a surface of a computer model having a set of computer model vertices and computer model polygons, wherein the annotations comprise line segments and are specified as geometry in the form of a set of vertices and edges that connect the vertices, comprising:

a processor to execute a program of instructions stored in a memory of the computer;

the memory to store a program of instructions for performing a method for annotating a surface of a computer model and the data defining a geometric model;

a graphics processor and a display to display an image of the computer model and the annotation;

means for selecting an annotation edge that connects a pair of the annotation vertices;

means for projecting the pair of annotation vertices of the edge onto the surface of the computer model to obtain projected vertices;

means for selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices;

means for cutting the surface of the model with the plane, the plane intersecting the model on a cutting line;

means for reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model; and

means for repeating the process for each annotation edge in the annotation specified.

In Claim 6:

Replace claim 6 with:

A computer product having a program comprising instructions which when executed on a computer perform a process for annotating the surface of a computer model having a set of

computer model vertices and computer model polygons, wherein the annotations comprise line segments and are specified as geometry in the form of a set of vertices and edges that connect the vertices, comprising the steps of:

a) Selecting an annotation edge that connects a pair of the annotation vertices;

b) projecting the pair of annotation vertices of the edge onto the surface of the computer model to obtain projected vertices;

c) selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices;

d) cutting the surface of the model with the cutting plane, the plane intersecting the model on a cutting line;

e) reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model; and

e) repeating steps b) to e) for each annotation edge in the annotation specified.

In Claim 7:

Replace claim 7 with:

A computer implemented method for annotating the surface of a computer model having a set of computer model vertices and computer model polygons, wherein the annotations comprise line segments and are specified as geometry in the form of a set of annotation vertices and annotation edges that connect the vertices, comprising the steps of:

a) Selecting an annotation edge that connects a pair of the annotation vertices;

b) projecting the pair of annotation vertices of the edge onto a surface of the computer model to obtain projected vertices, wherein said step of projecting annotation vertices comprises snapping a projected vertex to one of a nearest surface vertex and a nearest surface edge when said nearest surface vertex or nearest surface edge is within a tolerance value, and said projected vertex remaining where it is projected when said nearest surface vertex or nearest surface edge is not within said tolerance value;

c) selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices;

d) cutting the surface of the model with the cutting plane, the plane intersecting the model on a cutting line;

e) reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting

the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model; and

e) repeating steps b) to e) for each annotation edge in the annotation specified.

A clean copy of the amended claims is attached.

Reasons for Allowance

5. Claims 1-3 and 5-7 of the application are allowed over prior art of record.

6. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) Annotating a real world object using augmented reality; a computer model of a real world object is matched to the real object, allowing one to virtually annotate the real components with information from the corresponding model; augmented reality merges graphics with a view of the real object; user queries on the real object are translated into queries into the model producing information that can augment the user's view of the real world; augmented reality utilizes and exploits the potential of computer based information and databases; in augmented reality, the computer provides additional information that enhances or augments the real world;

augmented reality can be used to annotate parts of a machine that are identified by a user; queries with a pointing device on the real world object can be used to add or delete computer generated lines and text as annotations; annotations may move with the machine as its orientation changes (**E. Rose et al.,** "Annotating real-world objects using augmented reality", Proceedings of CG International '95, June 1995);

(2) a computer-implemented method for drawing and manipulating curves on polygon mesh surfaces in a three dimensional computer graphics system; the curves are constrained in their entirety to the surface of the polygon mesh; such curves provide better intuition for the shape and position of the curve than unconstrained three dimensional space curves; the method comprises storing in a memory an unparameterized surface and a surface curve comprising a set of surface points lying on the surface; the unparameterized surface is a polygon mesh representation of a 2-dimensional manifold embedded in a 3-dimensional space; the surface curve is a face-point curve representation of a 1-dimensional manifold embedded in the unparameterized surface; the method computes a displaced surface curve, comprising a set of displaced surface points lying on the surface (**Krishnamurthy,** U. S. Patent 6,256,039); and

(3) three-dimensional shape data processing apparatus that obtains the three-dimensional shape data of an object and analyzes the features of the object; it calculates the length of a path including at least four points on the surface of a three-dimensional shape; it accepts at least four points that designates the path on the surface of the shape; it groups the points into groups, each of which includes three points, wherein two points in one group are included in another group; it obtains the length between two adjacent points of the three points in one group along a line of intersection of a plane including the three points and the surface of the three dimensional shape

for each of the groups; it then obtains the second length between two points commonly included in the two groups, along the path; as a result, the length of the path designated by at least four points may be obtained (**Karaski et al.,** U. S. Patent 6,260,000).

Additional state of the art reviewed and considered by the Examiner is found in U.S. Patent 6,690,371; U.S. Patent 5,845,288; U.S. Patent 6,525,731; U.S. Patent 5,907,850; U.S. Patent 6,570,568; U.S. Patent 6,518,964; U.S. Patent 5,243,665; U.S. Patent 5,586,232; U.S. Patent 6,313,836; Suits et al. "Simplification of surface annotations", IEEE, October 2000; Karasick et al., "Schemata for iinterrogating solid boundaries", ACM, May, 1991; Wu et al., "Wide-range, person and illumination intensive head orientation estimation", IEEE, March 2000.

None of these references taken either alone or in combination with the prior art of record disclose a computer implemented method, a computer system and a computer product for annotating the surface of a computer model having a set of computer model vertices and computer model polygons, wherein the annotations comprise line segments and are specified as geometry in the form of a set of annotation vertices and annotation edges that connect the vertices, specifically including:

"(means for) selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices; and

(means for) reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model".

Because the closest prior art fails to teach or fairly suggest selecting a cutting plane between the pair of the projected vertices in which the cutting plane is selected by one of i) the pair of projected vertices and a midpoint of the relevant annotation edge and ii) the pair of projected vertices and an average of normals to surface polygons that contain the pair of projected vertices; and reconnecting the pair of projected vertices on the surface of the model by identifying points of intersection of the cutting plane with edges of the surface polygons, connecting one of the projected vertices to the nearest intersection point on the surface polygon edges, connecting the intersection points on each successive polygon that was intersected till the surface polygon on which the second projected vertex lies and then connecting a last intersection point to the second projected vertex, to produce the projection of the annotation edge on the computer model, as claimed by the Applicant.

7. Any comments considered necessary by applicants must be submitted no later than the payment of the issue fee and, to avoid processing dela8ys, should preferably accompany the

issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard, can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

K. Thangavelu
Art Unit 2123
July 5, 2005

Paul L. Rodriguez 7/8/05
Primary Examiner
Art Unit 2125